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TITLE: Method and apparatus for removing label from a container

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Method and apparatus for removing a label from a container which includes a cylindrical surface, by blowing air so as to be incident tangentially with respect to the cylindrical surface of the container and flow along the container surface toward a leading edge of the label as the container is rotated. An air knife having an air exit slit and a substantially planar surface disposed adjacent to and substantially perpendicular to the air exit slit utilizes the Coanda effect, such that air exiting from the air exit slit bends around and follows the substantially planar surface so as to flow tangentially to the cylindrical surface of the container and thereby remove the label as the container is rotated.

Plate 12 of the air knife 10 includes a substantially planar surface 16 disposed adjacent to and substantially perpendicular to the air exit slit 15. Accordingly, when air exits from the air exit slit 15, it bends around and follows the substantially planar surface 16 of the air knife 10 so as to flow tangentially to the cylindrical surface of the container C. Note that the distance between the plate 12 and the container C is exaggerated in FIG. 2 to avoid confusion. The reason the air bends around the substantially planar surface 16 is due to the fluid flow phenomenon known as the

Coanda effect, also referred to as the wall attachment effect. The Coanda effect is the tendency of a flowing fluid to follow a surface against which the fluid is flowing even as the surface changes direction. The primary stream of air which follows the surface 16 also entrains surrounding air.

The present inventors have also observed that the Coanda effect transfers to the cylindrical surface of the container C such that the air flow attaches to the cylindrical container surface and bends around the diameter for a given distance as is apparent from FIGS. 1A through 1D. This results in a more efficient use of the air supply for a given air velocity.

Thus, by taking advantage of the Coanda effect, rather than point the air knife slit 15 directly at the leading edge 17 of the label L, the air knife 10 is arranged as shown in FIGS. 1A through 1D such that the air slit 15 is directed at a position off-set from the rotational axis of the container C.

Again, once the transfer of the ink from the heat transfer label film has been effected, the label or film substrate L is then removed from the container C. In order to effect removal of the label L, the air knife 10 is mounted as described in detail above such that the air flow will be directed so as to be incident tangentially with respect to the cylindrical surface of the container C. The container C is rotated by the rotating means 1 shown in FIG. 2 and air is then blown from the air knife 10 and the air bends around the one plate member 12 of the air knife 10 due to the Coanda effect as explained above so as to be incident tangentially to the container C and then continues to flow around the container surface toward the leading edge 17 of the label L as the

container is rotated.

FIG. 3 shows an alternative embodiment of the present invention which likewise utilizes the Coanda effect such that the air flow exiting from an air knife slit 15' bends around a substantially planar surface 16' of the air knife 10' so as to flow tangentially to the cylindrical surface of the container C'. However, in the embodiment of FIG. 3, the air knife 10' is arranged adjacent to the container C' (i.e., the mirror image of the first embodiment) so that the air exit slit 15' of the air knife 10' points away from the container C'. Note that like elements are denoted by the same reference numeral except that a prime is included.